

COMPARISON OF SUNPHOTOMETRIC MEASUREMENTS DURING THE
FALL 1997 ARM INTENSIVE OBSERVATION PERIOD

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ABSTRACT

Among the recommendations of the most recent World Meteorological Organization workshop to address aerosol optical depth measurements (WMO/TD 659) was a suggestion that instruments be compared at a high-altitude site. In fact, this has not yet happened in an international setting as originally conceived. However, as a consequence of an Intensive Observation Period held at the Southern Great Plains (SGP) Atmospheric Radiation Measurement (ARM) site in the Fall of 1997 to study aerosols using remote and in situ techniques, we had the opportunity to compare measurements from five different sun radiometers with five independent calibration paths operating over a three-week period.

The five instruments are tracking devices that make measurements throughout the day. Three measure the direct beam radiation with a narrow field of view and two use alternate shading and unshading of a two-pi steradian receiver by a shadowing band to calculate direct irradiance. All instruments sampled narrowband wavelength regions between 340-1080 nm with half-widths of 10 nm or smaller. Each instrument was calibrated independently using one of three techniques including Langley calibrations from Mauna Loa over a few days, Langley calibrations from the SGP ARM site over a two-month period, and using transfer of calibration by comparison with a similar instrument that had been previously calibrated on Mauna Loa.

The results of the comparisons suggest that aerosol optical depth measurements made with different instruments with independent calibrations and independent corrections for ozone and Rayleigh scattering, and independent air mass calculations agreed to about 0.02 in the worst cases and on average to about 0.01. It is suggested that these comparisons, which meet the target accuracy of the WMO, were achieved primarily because of meticulous attention to calibration by each party involved.